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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/464,322 12/15/99 KWON

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EXAMINER

CHILLIC ART UNIT	PAPER NUMBER
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2815
DATE MAILED:

09/12/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

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Office Action Summary

Application No.

09/464,322

Applicant(s)

KWON ET AL.

Examiner

Chris C. Chu

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 June 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 28 June 2001 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicant's reply was received in the Office on June 28, 2001 has been entered in the case.

Information Disclosure Statement

2. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 6, 8, 9, 11, 14, 16, 17, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh et al.

Note Fig. 5, which shows a semiconductor chip package comprising a substrate (52₂) having a plurality of bonding pads; a semiconductor chip (54) having a plurality of conductive bumps; a heat slug (51) bonded to a backside of the semiconductor chip; and a solder film (56) that bonds the heat slug to the backside of the semiconductor chip.

Regarding claim 3, Itoh et al. discloses that the backside of the semiconductor chip includes a metal layer (55 in the Fig. 5) formed thereon for strengthening adhesion between the semiconductor chip and the solder film. As to the language on lines 2 and 3 of claim 3, “formed thereon for strengthening adhesion between the semiconductor chip and the solder film”, applicant should note that this is merely “result or function” language which cannot be relied upon to define over Itoh et al., since Itoh et al. discloses all of the claimed elements and their recited relationships. Moreover, the examiner will presume that the recited results are inherent in Itoh et al., since all of the claimed elements and the relationships therebetween are met by Itoh et al. If the recited result or function is not inherent in Itoh et al., then this would mean that applicant has failed to recite one or more critical features of the present invention (i.e., a problem under 112, first paragraph).

Regarding claim 6, the Fig. 5 clearly shows that the solder film (56) has a size equal to or larger than a size of the semiconductor chip (54).

Regarding claim 8, Itoh et al. discloses that the heat slug comprises an adhesion layer (column 7, lines 14 – 15) formed on a surface of the heat slug that contacts the solder film (column 10, lines 28 - 31).

Regarding claim 9, Itoh et al. discloses that the adhesion layer is a layer selected from a group consisting of a Ni/Au layer, a Ag layer, and a Pd layer (column 8, lines 43 – 44).

Regarding claim 11, see Fig. 5, which clearly shows that a portion of the heat slug (51) is attached to the substrate (52z).

Regarding claim 14, Itoh et al. discloses a “method of fabricating a semiconductor chip package” by preparing the semiconductor chip (54 in Fig. 5) having a plurality of conductive bumps on a front surface of the semiconductor chip; bonding a heat slug (51 in Fig. 5) on a backside of the semiconductor chip using a solder film (56 in Fig. 5); and attaching the semiconductor chip on a substrate (52z in Fig. 5) such that the conductive bumps of the semiconductor chip contacts a plurality of bonding pads on the substrate. Further, the phrase “the conductive bumps of the semiconductor chip contacts a plurality of bonding pads on the substrate” is structure inherent in Itoh et al. (see Fig. 5).

Regarding claim 16, in Fig. 5, which shows a semiconductor chip package comprising a substrate (52z) having a plurality of bonding pads; a semiconductor chip (54) having a plurality of conductive bumps; a heat slug (51) bonded to a backside of the semiconductor chip, the heat slug comprising a top portion, side standing portions bent from the top portion, and side end portions (see 51 in Fig. 5); and a solder film (56) that bonds the heat slug to the backside of the semiconductor chip.

Regarding claim 17, the Fig. 5 clearly shows that the solder film (56) has a size equal to or larger than a size of the semiconductor chip (54).

Art Unit: 2815

Regarding claim 19, Itoh et al. discloses that the heat slug comprises an adhesion layer formed on a surface of the heat slug that contacts the solder film (column 7, lines 14 – 15 and column 10, lines 28 - 31).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Haley.

Itoh et al. discloses the claimed invention except that the material of the solder film, which includes one selected from “a group consisting of Pb, Sn, Ag, In, and Bi.” However, Haley discloses the material of the solder film (column 3, lines 66 –67). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by selecting from a group consisting of Pb, Sn, Ag, In, and Bi for the material of the solder film as taught by Haley. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the bond strength between the semiconductor chip and the heat slug.

Regarding claim 13, Itoh et al. discloses the claimed invention except that a plurality of “throughholes” on the heat slugs. However, Haley discloses the plurality of “throughholes” on

Art Unit: 2815

the heat slugs (108 and 109 in Fig. 1). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by adding the plurality of “throughholes” on the heat slugs as taught by Haley. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of decreasing moisture inside of the package.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Furukawa et al.

Itoh et al. discloses the claimed invention except that the material of the metal layer, which includes one selected from “a group consisting of VN_i/Au, Ti/VN_i/Au, Cr/Vn_i/Au, Ti/Pt/Au, and etc.” However, Furukawa et al. discloses the material of the metal layer (column 9, lines 63 –64). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by selecting from a group consisting of VN_i/Au, Ti/VN_i/Au, Cr/Vn_i/Au, Ti/Pt/Au, and etc for the material of the metal layer as taught by Furukawa et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the bond strength between the semiconductor chip and the solder film.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Maheshwari et al.

Itoh et al. discloses the claimed invention except that an underfilling material to fill a space between the semiconductor chip and the substrate. However, Fig. 2 of Maheshwari et al.

Art Unit: 2815

clearly shows that an underfilling material is filled between the semiconductor chip and the substrate. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by adding the underfilling material between the semiconductor chip and the substrate as taught by Maheshwari et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of preventing the cracking of the conductive bumps.

9. Claims 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Takahama et al.

Itoh et al. discloses the claimed invention except that the heat slug is formed of a material selected from a group consisting of Cu, Al, and CuW. However, Takahama et al. discloses that the material of the heat slug (column 6, lines 38 – 39). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by selecting from a group consisting as of Cu, Al, and CuW as taught by Takahama et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of improving heat dissipation.

10. Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Jeong et al.

Itoh et al. discloses the claimed invention except that the heat slug is coated with an anodizing layer on a surface of the heat slug that is opposite to another surface of the heat slug, on which the semiconductor chip is bonded. However, Jeong et al. discloses that the anodizing

Art Unit: 2815

layer (73b in Fig. 6 and column 8, lines 2 – 5 and read column 7, lines 65 ~ 67) on a surface of the heat slug (73) that is opposite to another surface of the heat slug, on which the semiconductor chip is bonded (see Fig. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by adding the anodizing layer as taught by Jeong et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the corrosion resistant and electrical insulation.

11. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al.

Itoh et al. discloses the claimed invention except that the adhesive includes silicon rubber or elastomer. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use silicon rubber or elastomer material for the adhesive, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the bond strength between the heat slug and the substrate. In re Leshin, 125 USPQ 416.

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Wang et al.

Itoh et al. discloses the claimed invention except that filling a resin into a space between the semiconductor chip and the substrate. However, Wang et al. discloses that filling a resin into

Art Unit: 2815

a space between the semiconductor chip and the substrate. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by filling a resin into a space between the semiconductor chip and the substrate as taught by Wang et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the attachment between the semiconductor chip and the substrate.

Response to Arguments

13. Applicant's arguments filed June 28, 2001 have been fully considered but they are not persuasive. On page 9 of applicant's response to office action, where the applicant responds, "Itoh discloses a heat sink attached not to a semiconductor chip, but to another structure (an envelope)." This is not persuasive since; first above all, the preamble defines the claims to be open ended. Secondly, the claim does not exclude that other structure to be formed between the heat slug and the semiconductor chip. Because of above reasons, the claim does not require heat slug to be attached or contacted directly to the semiconductor chip. This is evident based on applicant's own claim language, where applicant defines the solder film between the heat slug and the semiconductor chip. Also, Fig. 1 of instant application contains an adhesion layer (14), under-filling portion (50), and solder film (30) between the heat slug and the semiconductor chip. Applicant's arguments against the rejection of claims 10 and 20 are not persuasive for the reasons provided in the body of the rejection (see paragraph 10 of this office action).

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Barrow discloses the semiconductor chip package containing a heat slug.

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the

Art Unit: 2815

organization where this application or proceeding is assigned are (703) 308-7382 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Chris C. Chu
Examiner
Art Unit 2815

c.c.
September 10, 2001

A handwritten signature in black ink, appearing to read 'Eddie Lee', is positioned above the printed name and title.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800